

IN THE SPECIFICATION:

Please replace the paragraph beginning at page 3, line 35, with the following rewritten paragraph:

B¹

In preferred embodiments of the invention, the tissue culture is an embryo culture. In another preferred embodiment, the culture is supplemented with malic acid at a concentration of between about 0.01% and 5% by weight of the culture medium. In another preferred embodiment, the culture is supplemented with 3,4-dihydroxybenzaldehyde at a concentration of between about 0.1 and 5 mM. In another embodiment, the culture is supplemented with about 0.01 to about 5% by weight of a compound selected from the group consisting of succinic acid, oxaloacetic acid, citric acid and pyruvic acid. In yet another embodiment, the culture is supplemented with about 1 to about 100 µg/ml of glycosylated lysozyme.

Please replace the paragraph beginning at page 5, line 29, with the following rewritten paragraph:

B²

According to yet another aspect of the invention, a method for improving vanillin accumulation in cell or tissue culture of *Vanilla planifolia* is provided, which comprises inhibiting production or activity of vanillyl alcohol dehydrogenase in cells comprising the cell or tissue culture, the inhibition resulting in the improved vanillin accumulation. In one embodiment, the inhibiting comprises genetically engineering the cells to inhibit expression of a gene encoding the vanillyl alcohol dehydrogenase. In another embodiment, the inhibiting comprises treating the culture with an inhibitor of vanillyl alcohol dehydrogenase activity. Cultures produced by the aforementioned method are also provided.

Please replace the paragraph beginning at page 11, line 4, with the following rewritten paragraph:

B³

The enzyme catalyzing the conversion of vanillin to vanillyl alcohol has been determined to be an alcohol dehydrogenase, which the inventors have named vanillyl alcohol dehydrogenase (VAD). The purification of VAD from cultured cells of *V. planifolia* and its characterization are described in Example 8.

Please replace the paragraph beginning at page 12, line 12, with the following rewritten paragraph:

B⁴

Another useful elicitor of vanillin production in cultured vanilla is glycosylated lysozyme, a protein elicitor described in U.S. Patent No. 5,552,307 to Kessler et al. As shown in Example 5, treatment with this elicitor more than doubles the amount of vanillin produced in cultured vanilla cells.

[Please replace the paragraph beginning at page 12, line 18, with the following rewritten paragraph:]

Another elicitor of vanillin production in cultured cells is heat stress, i.e. placing the cultures at 33-37 °C for an extended period of time. Heat stress of this nature has been found to increase production of vanillin and related compounds in cultured cells by at least 2-3 fold. Similarly, shear stress, as described in greater detail in the examples, increases production of vanillin and related compounds in cultured cells by at least 2-3 fold.

Please replace the paragraph beginning at page 14, line 7, with the following rewritten paragraph:

B5
The next key enzyme in the vanillin biosynthetic pathway is the oxygenase that catalyzes hydroxylation of p-hydroxybenzyl alcohol to 3,4-dihydroxybenzyl alcohol. This enzyme is believed to be a cytochrome P450 monooxygenase, and this step is believed to be the rate-limiting step in the vanillin biosynthetic pathway in cultured cells. For these reasons, up-regulation or some other form of supplementation of this enzyme in cultured cells and in intact plants.

Please replace the paragraph beginning at page 25, line 16, with the following rewritten paragraph:

B6
Malic acid was applied to the following: (1) intact roots, (2) intact shoots, (3) embryo cultures, (4) cluster cultures, and (5) cuttings. The age of the cultures were between 0 and 1 month. Malic acid was applied alone or in combination with the following: starvation without sugar (sucrose); shear stress induced by bioreactor impeller; citric acid; varying concentrations of oxygen and ethylene; oxaloacetic acid (sodium salt); ascorbic acid; pyruvic acid; glutamic acid; succinic acid; or salt stress.

Please replace the paragraph beginning at page 28, line 45, with the following rewritten paragraph:

B7
The table below shows the results of experiments testing the effect of glycosylated lysozyme, an elicitor protein described in U.S. Patent No. 5,552,307 on vanillin precursors in vanilla embryo cultures. As can be seen, these proteins were effective in stimulating vanillin production in the cultured cells.

Please replace the paragraph beginning at page 31, line 10, with the following rewritten paragraph:

B8 crude enzyme extract: 10 μ l

substrate 100 μ l

(substrate=1.8 mM p-coumarate in 0.1 M Tris/HCl, pH 8.0 with 10 mM DTT)
